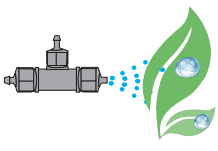
TURBO FOG

IT'S DIFFERENT...

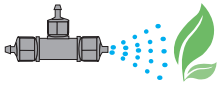
It is Hydro-pneumatic fogging System

Saves water, saves energy and still delivers best fogging performance.

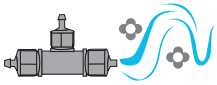
Cooling



Humidification



Phytosanitary Treatment Application

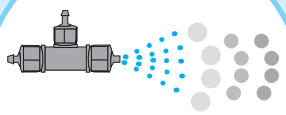


Aerial Aroma Application

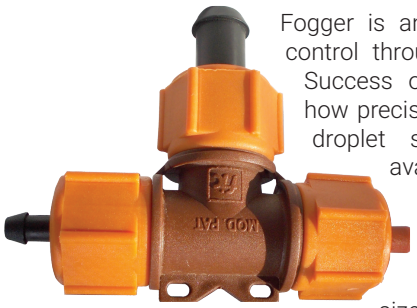
Save H_2O & Energy upto 70%

Delivers even 3 micron at low pressure Air 1.5 bar / water 1.6 kg/cm²

Best Performance in Industry



Dust Suppression



Fogger is an essential element for climate control through cooling and humidification. Success of fogging system depends on how precisely one can maintain the required droplet size. With convential foggers available in the industry, average droplet size achived is 80 to 100 micron at about 4 kg/cm² pressure. With patentetd Turbo Fog technology average dropliet size is adjustable and starts from as low as 3 micron at much lower pressure.

Technology:

Turbo Fog is a patented hydro-pneumatic fogger provides a unique compressed air-water fog system, which operates at low air pressure (2kg/cm²- 2.5 kg/cm²) and low water pressure (2.5 kg/cm² – 6 kg/cm²). Droplet size (micronisation), fog distance (cloud) and flow rate per nozzle can be varied & adjusted based on application requirements, by simple regulating air and/or water pressures.

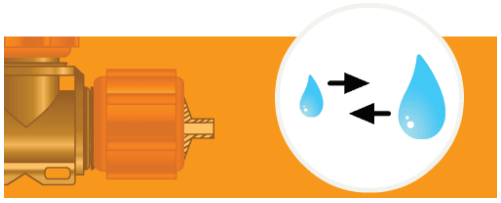
The compressed air forces the fog atomization to exit the TURBO FOG nozzle at high speed (4m/s measured at 4 meters distance from the nozzle), hence creating a micro-ventilation effect. TURBO FOG atomizing nozzle state of the art engineering design contributes to achieve maximum application homogeneity, longest atomized spray distance and fully variable flow rate and droplet size per nozzle.

The smaller the TURBO FOG exit orifice diameter is, the lower the TURBO FOG nozzle compressed air consumption will be, and the shorter the atomising spray distance will be. Larger the TURBO FOG exit orifice diameter is, the higher the TURBO FOG nozzle compressed air consumption will be, the finer the droplet size will be (down to 5microns average droplet size), and the longer the atomising spray distance will be.

Due to the significant installation low running costs, easy installation, little maintenance and long service life, the TURBO FOG system will increase your business productivity and achieve high application performance and efficiency.

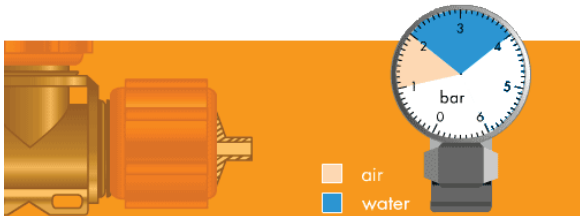
Turbo Fog Competitive Advantages

1) Ultra Fine Droplet Size 3 Micro & Adjustable Flow Rate Start from 1.3 lph



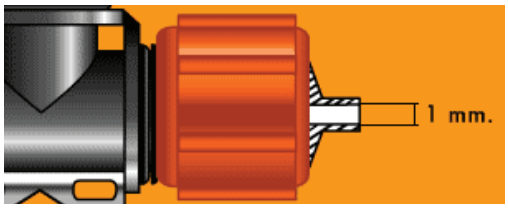
- Fully adjustable droplet size (from 3 microns up to 120microns).
- Fogger flow rate can be simply varied at any time by regulating the water and/or air pressure.

2) Significant Energy Saving



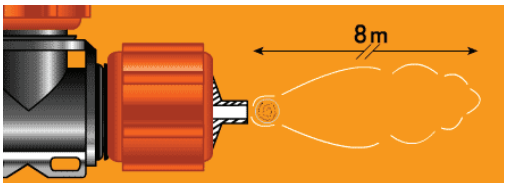
- Maximum efficiency at Air and Liquid low pressure operating conditions.
- Low maintenance.
- Minimum compressed air flow rate consumption.

3) No Risk of Clogging



- TURBO FOG is available in three large sized nozzles, i.e. 0.8 mm, 1.0 mm and 1.2 mm not suseptible to clogging.
- No need of special filters, RO system and /or decal-cification water treatment.

4) Atomising Spray Homogeneity



- Patented air-water mixing technology makes uniform droplet size distribution.
- 8m long atomising spray distance (adjustable according to air/water ratio)

5) Easy Installation

- Easy to install fittingsfor air and water line connection
- TURBO FOG nozzle connection to any air and liquid flexible and/or rigid feeding pipes via clamps, direct connection, micro-tube etc.

6) TURBO FOG Nozzle Manufactured in Polymers

- Long service life.
- Resistant to any chemical or sun-ray attack.
- No abrasion or wear

Applications

Greenhouse

The TURBO FOG system has been successfully deployed for the last 15 years in multiple greenhouse installations, various crops, greenhouse types, nurseries, propagation houses etc.

Farming

- Poultry farms: broilers, ducks, chickens, turkeys etc.
- Hen farms: laying hens, reproductive hens.
- Pig farms.
- Cattle farms: sheep, goats etc.
- Rabbit farms: hare, pika etc.

Industry

The climate control project design of an industry will depend on a number of variables such as:

- Industry sector and activity.
- Manufacturing process.
- Exterior climate conditions.
- Interior heat added by machines and employees.
- Air changes required within the industry activity.

There are three climate and ambient control necessity types within the industry sector, which TURBO FOG does cover :

- Cooling
- Humidity control
- Ambient sanitary control (dust suppression, odor neutralisation etc.)

Leisure & Residential

The TURBO FOG technology deployed in the Leisure and Residential sectors will bring new customers and boost sales by increasing the comfort and well-being of customers. The fully micronized and evaporated mist (no wetting) created in the environment generates a unique microclimate in the area where installed.

The typical installations where the TURBO FOG system is being deployed and is adding the most value are:

- Business: restaurants, sports clubs, swimming pools, concert halls, garden centers, pubs , marriage hall etc.
- Private - Residential: private houses with terraces and gardens, patio, social clubs, Spa's etc.

Climate Control of Temperature and Humidity in Greenhouses

Climate control in a greenhouse is based on the principle of the exchange of energy between the air and the fog moisture from Turbo Fog.

One calorie is the amount of heat necessary to raise the temperature of 1 cm3 of water by 1°C.

The conversion of water from liquid to vapor absorbs heat from the surrounding air, at a rate of 590 calories/1 gram of evaporated water (1 cm3). This process lowers the air temperature.

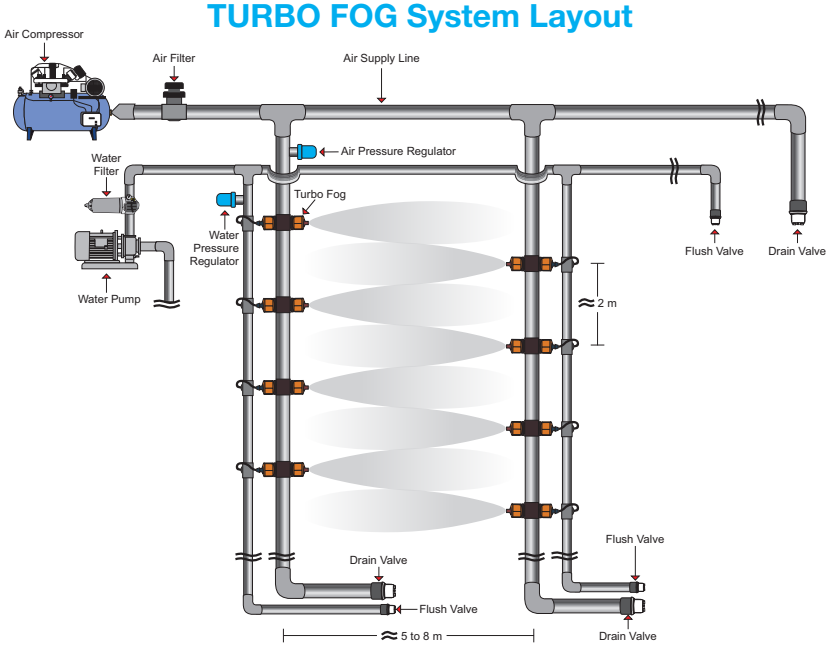
Efficient installation and operation can reduce the temperature in the greenhouse by between 4 to 6°C, depending on the environmental conditions. Efficiency of the cooling system depends on two environmental factors:

- External temperature
- External humidity

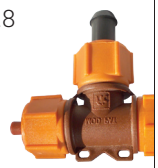
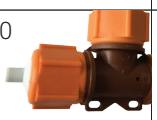
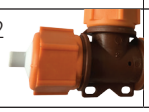
For efficient cooling with the Turbo Fog we need an efficient ventilation system which continuously introduces external dry air into the greenhouse to replace the humid air.

Whereas, for humidity level to be increased the ventilation system must be shut down.

TURBO FOG System Layout



TURBO FOG Nozzle selection based on applications

TURBO FOG nozzle Size (mm)	Air pressure range (kg/cm²)	*Water pressure range (kg/cm²)	Maximum atomising spray distance (m)	Water flow rate (lph)	Applications	Business Sectors
0.8 	1.5 to 2.5	2 to 6	7	2 to 10	• Cooling • Humidification • Water disolved **product Application:** - Phytosanitary - Disinfectant - Vaccination - Foliar treatment etc.	• Agriculture • Farming • Industry Note: air pressure ranging from 3 to 4bar
1.0 	1 to 2.5	2 to 6	8	2 to 10	Above + below • Odor neutralisation • Dust suppression • Static Electricity elimination	• Agriculture • Residential • Industry • Leisure
1.2 	0.8 to 2.5	2 to 6	10	2 to 11	Above + below • Odor neutralization • Dust suppression	• Industry • Research & Development • Residence

* Water pressure must always be at least 0.5 bar above air pressure.

TURBO FOG Nozzle selection based on Business Sector

The 0.8 mm orifice TURBO FOG nozzle is recommended for the following sector types:

- Installations larger than 10,000 m² within the intensive agriculture sector.
- Installation larger than 750 m² within the farming sector.
- Industrial installations when a minimum of 3.5 bar air pressure is available at client site.

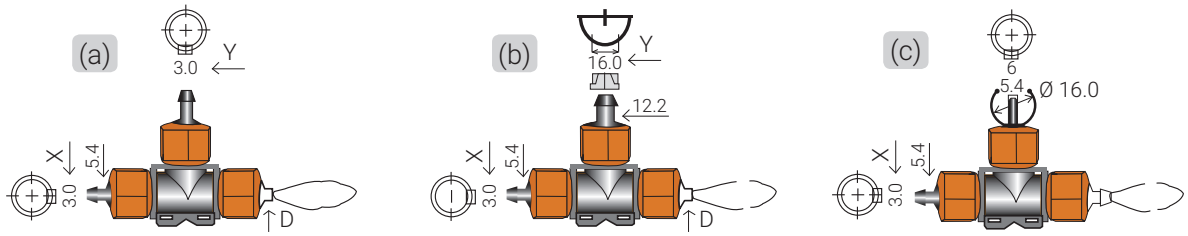
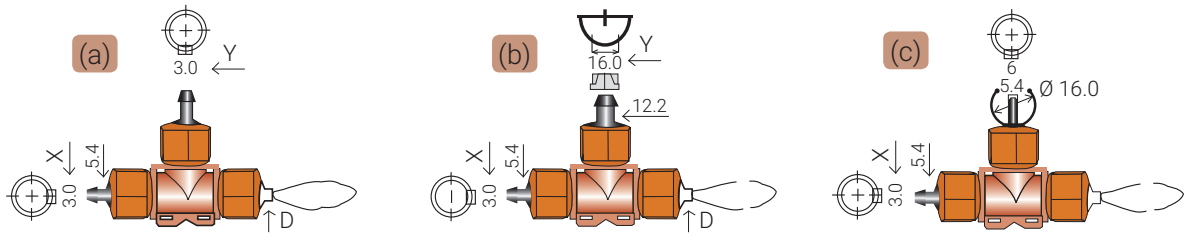
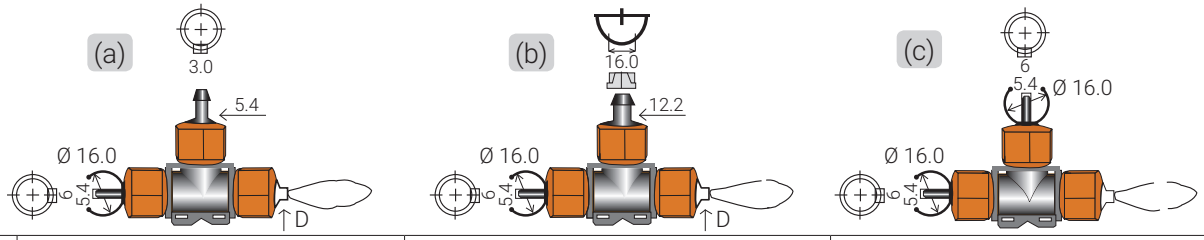
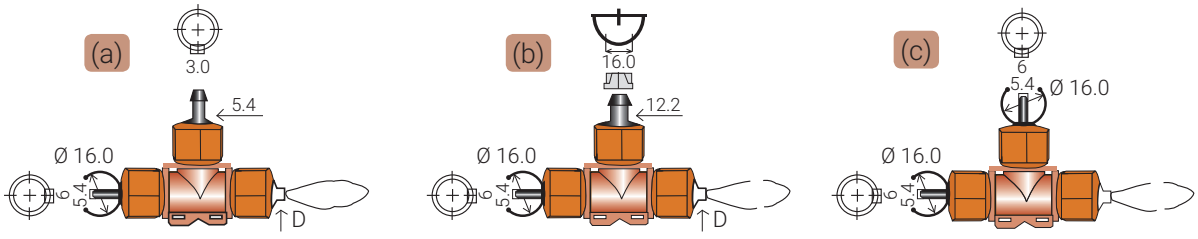
The 1.0 mm orifice TURBO FOG nozzle is recommended for the following sector types:

- Installations smaller than 10,000m² within the intensive agriculture sector.
- Installations smaller than 750m² within the farming sector.
- Industrial installations.
- Leisure / residential installations.

The 1.2 mm orifice TURBO FOG nozzle is recommended for the following sector types:

- Research and development projects.
- Industrial installations smaller than 250m².
- Leisure / residential installation with less than 15 nozzles.

TURBO FOG Connection Type

Water Inlet Connection (X, mm)		Air Inlet Connection (Y, mm)	Nozzle Size (D, mm)
Standard Nozzle (withouto LPD) - Black			
			
(a)	3	3	0.8, 1.0 & 1.2
(b)	3	16	0.8, 1.0 & 1.2
(c)	3	6	0.8, 1.0 & 1.2
Special Nozzle (With LPD) - Brown (LPD opening pressure 2.5 kg/cm² & Closing pressure 1.0 kg/cm²)			
			
(a)	3	3	0.8, 1.0 & 1.2
(b)	3	16	0.8, 1.0 & 1.2
(c)	3	6	0.8, 1.0 & 1.2
Standard Nozzle (without LPD) - Black			
			
(a)	6	3	0.8, 1.0 & 1.2
(b)	6	16	0.8, 1.0 & 1.2
(c)	6	6	0.8, 1.0 & 1.2
Special Nozzle (With LPD) - Brown (LPD opening pressure 2.5 kg/cm² & Closing pressure 1.0 kg/cm²)			
			
(a)	6	3	0.8, 1.0 & 1.2
(b)	6	16	0.8, 1.0 & 1.2
(c)	6	6	0.8, 1.0 & 1.2

Welcome to Jain. We are ready to add value to your business. We are ready to provide you technical information, please provide us with technical data in order to work collaboratively on project design and execution, get to know better our business lines and product offering or simple to get to know each other for a first meeting. Please contact our representative or call us on our toll free number18005995000 for any query or inquiry.

We will be pleased to provide you full life cycle project support from design through execution and commissioning service.

Selection of Compressor for Turbo Fog System

Air compressor is a key element in the delivery of TURBO FOG installations, since they provide maximum efficiency, high performance and long service life.

Selection of compressor for TURBO FOG system is based on following parameters:

1) Select the Turbo Fog nozzle size based on mean droplet size requirement.
2) Calculate number of Turbo Fog required to meet the requirement.
3) Calculate air flow and water flow requirement based on maximum number of Turbo Fog to be operated at a time at a given air and water pressure.
4) Select compressor based on total quantity of air required, for safety you can consider 15 % extra air.

e.g. A Polyhouse (12 m x 10 m) system is designed to meet requirement of 80 % humidity, need 30 numbers of Turbo Fog's with air pressure of 2 kg/cm² and water pressure for 2.5 kg/cm². Note: This is selection of compressor only.

Solution:

As per demand 30 Turbo Fogs operated at water pressure of 2.5 kg/cm² and air pressure of 2 kg/cm².

Select compressed air consumption per nozzle from table = 0.71 m³/hr

Nozzles operated = 30 nos.

Total Volume of Compressed air required	= 0.71 x 30 m³/hr = 21.3 m³/hr
For safety we can add 15 % extra air	= 21.3 x 1.15 = 24.5 = 25 m²/hr

Hence we need 25m³/hr compressor for current system.

Note:

- Please select oil free compressor or use proper oil filter externally to avoid oil seepage in to airline.
- Sizing the compressor needs decision about two factors:
  - Size of air pump (pressure & flow capacity
  - Size of air tank
- This decision is to be taken considering following parameters:
  - Air flow & pressure requirement
  - Maximum allowable time period for foggers continuous operation
  - Maximum wait time between fogger operation
- If foggers are to be operated continuously without any interval, then air inflow shall match air outflow and air tank acts as buffer.
- We can minimise size of air pump (cost also), if we allow interval between fogger operation. This interval can be calculated according to time required to fill up the air tank to maximum pressure.

Support table to be used for the design of Turbo Fog system projects for 0.8 mm & 1.0 mm nozzle size

Item	Compressed Air Pressure (kg/cm²)	water pressure (kg/cm²)	Compressed air consumption per nozzle (m3/hr)	Water Flow Rate per Nozzle (lph)	Fog Spray Distance (m)*	Mean Droplet Size (Microns) **	Com-pressed air consum-ption per nozzle (m³/hr)	Water Flow Rate per Nozzle (lph)	Fog Spray Distance (m)*	Mean Droplet Size (microns) **	Com-pressed air consum-ption per nozzle (m³/hr)	Water Flow Rate per Nozzle (lph)	Fog Spray Distance (m)*	Mean Droplet Size (microns) **
			0.8mm				1.0 mm				1.2 mm			
1	0.5	MIN		-	-	-	-	-	-	-				
2	0.5	1.2		-	-	-	-	-	-	-				
3	0.5	1.5	0.4	1.32	2.5	17	-	-	-	-	1.01	1.86	6	7
4	0.5	2.0	0.23	3.12	3.0	74	0.69	2.04	5.5	15	0.75	3.60	5.5	25
5	0.5	3.0	0.13	5.49	3.0	110	0.54	4.32	4.5	47	0.67	5.97	5.5	47
6	0.5	4.0	0.11	6.84	2.5	119	0.45	5.97	4	60	0.58	7.80	5.5	60
7	1.0	1.2		-	-	-		-	-	-				
8	1.0	1.5	0.47	1.92	4.0	18	1.27	1.44	7	4	1.31	2.76	7.5	8
9	1.0	2.0	0.31	3.84	3.5	61	0.98	2.94	7	11	1.20	4.32	7.5	15
10	1.0	3.0	0.25	5.40	3.5	80	0.78	4.74	7	31	0.98	6.48	7	34
11	1.0	4.0	0.21	6.84	3.5	94	0.68	6.48	6.5	50	0.87	8.80	7	47
12	1.0	5.0	0.18	8.40	3.5	105	0.63	7.65	6.5	60	0.76	9.48	7	59
13	1.5	1.6	0.58	2.10	5.5	17	1.59	1.5	7	3	1.96	2.22	7	4
14	1.5	2.0	0.52	3.06	6.0	32	1.28	3.18	7.5	9	1.67	3.54	8	7
15	1.5	3.0	0.41	5.07	6.5	62	1.08	5.1	7.5	22	1.33	5.85	8	20
16	1.5	4.0	0.34	6.52	6.0	74	0.96	6.66	7.5	38	1.21	7.50	8	30
17	1.5	5.0	0.29	7.90	5.5	86	0.87	7.98	7	47	1.10	8.92	8	43
18	1.5	6.0	0.25	9.36	5.0	96	0.82	9.06	7	54	1.00	10.50	8	51
19	2.0	2.5	0.71	3.00	7.0	19	1.65	3.09	8	7	2.02	4.40	8.5	7
20	2.0	3.0	0.58	4.14	7.0	39	1.46	4.44	8	11	1.75	5.18	9	14
21	2.0	4.0	0.47	5.94	7.0	58	1.26	6.06	8	23	1.58	6.90	9	19
22	2.0	5.0	0.40	7.46	6.5	77	1.10	7.42	8	35	1.45	8.30	9	30
23	2.0	6.0	0.35	8.61	6.5	84	1.01	8.70	8	44	1.36	9.66	8.5	42
24	2.5	3.0	0.80	3.18	7.5	17	1.88	3.12	8.5	5	2.31	3.84	10	6
25	2.5	4.0	0.67	5.31	8.0	43	1.60	5.25	8.5	14	2.12	6.06	9.5	11
26	2.5	5.0	0.57	7.02	7.5	60	1.41	6.78	8.5	23	1.88	7.74	9.5	20
27	2.5	6.0	0.50	8.10	7.5	71	1.27	8.22	8.5	32	1.76	8.91	9.5	25

Notes

- All the data provided above has been measured on a specific laboratory installation. Spray nozzle technical parameters may vary due to installation type, supply pipe connection, temperature, relative humidity, ventilation flow rate and any other relevant working variable.
- Data measure has been performed at a range between 20ºC and 24ºC and a relative humidity range between 35% and 50%
- *Spray distance has been measured by installing the spray nozzles at 2.5 above ground level.
- **Droplet size refers to DMN. DMN is the droplet diameter, which results when the number of droplets over DMN equals the number of droplets under DMN.

Global Presence: Jain Irrigation Systems Ltd. (JISL) derives its name from the pioneering work it did for the Micro Irrigation Industry in India. However, there is more to Jain Irrigation than Irrigation. Now Jain Irrigation is a diversified entity with turnover in excess of Rs. 6000 crore. We have a Pan- India & Global presence with 30 manufacturing bases spread over 4 continents. Our products are supplied to over 116 countries with able assistance from more than 6700 dealers and distributors worldwide.

Micro Irrigation: The Corporation has pioneered and raised a new Micro Irrigation industry in India and thereby helped harbinger a Second Green Revolution. The Micro-Irrigation Division manufactures a full range of precision-irrigation products and provides services from soil/ topographical survey, engineering design, supply, installation and commissioning to agronomic support for millions of farmers worldwide. It is the only company in the world which has the largest basket of product and system solutions that can suit any climatic/topographical/ crop conditions. The division's pool of over 1000 agronomists, irrigation engineers and technicians are well equipped to support the farmer customers across the globe. The company nurtures a sprawling 2300 acre Hi-Tech Agri Demonstration farm and a training Institute.

Plastic Piping: Presently, JISL is the largest producer in Asia of PVC and PE piping systems for all conceivable applications with pipes ranging from as small as 3 mm to 2000 mm in diameter and in pressure ratings ranging from 1.00 kg/cm² to 25 kg/cm². JISL has a production capacity of over 5,00,000 tonne per annum or 8000 km/day of plastic pipes. The Piping Division includes a variety of PVC and PE Fittings catering to irrigation needs of the farmers apart from the urban and rural infrastructure needs. The pipes are manufactured conforming to BIS, DIN, ISO, ASTM, TEC, Australian Standards as well as other customised specifications.

Biotechnology: The Tissue Culture Division grows Banana, Pomegranate, Strawberry, Guava, Coffee, Sugarcane plantlets and has established vast primary and secondary hardening facilities and R&D labs.

Green Energy: JISL Pioneered Solar water pumping systems in the country. Jain Solar water pumping system is a standalone system operating on power generated by Solar Photovoltaic panels which are also manufactured in house state-of-the-art facility. JISL has installed more than 20000 Solar Pumps. All these products are in harmony with the group's mission, "Leave This World Better Than You Found It".

Jain Green Energy division also offers Solar Thermal Water Heating Systems, Solar Photovoltaic, Bio-Gas and Bio-Energy alternate energy solutions.

Agricultural Processing: Agro Processed Products Division processes tropical fruits such as Mango, Banana, Guava, Pomegranate into Purees, Concentrates & Juices. The company also has a Dehydration facility which dehydrates Onions & Vegetables. Agricultural and Fruit processing wastes from these processing plants are converted to Bio-Energy to partially run the plants. The residue after the Bio-Energy generation is used as an Organic Manure.

Plastic sheet division's globally marketed products help conserve forests by providing alternatives to wood in the home building market.

Turn-key Projects: JISL undertakes Integrated Agricultural Development Projects on Turn-Key basis from Concept to Commissioning with value added services. JISL offers cost effective, down-to-earth solutions for complex challenges backed by our core strength of global knowledge and experience combined with local man-power which is an ideal combination of technology, intelligence and common sense. Whatever be the nature of the project requirement, JISL can assure Total Turn-Key solutions and maximum value for the farmers. It can also undertake Watershed or Wasteland development projects. Such projects normally begins with selection of site, survey of the command area, identification of appropriate crops, designing of the suitable irrigation systems, determination of agronomic practices, use of other hi-tech agro inputs, providing on-going technical services & training and pre & post harvesting techniques, provide assistance for operation and maintenance of the systems.

The Company has successfully executed large scale turn-key irrigation projects from conception to completion not only in India but also overseas.

Jain Irrigation offers following turn-key Solutions:

- Integrated irrigation solutions.
- Integrated agricultural development projects.
- Reuse of waste water for agriculture.
- Dust suppression.
- Lift & Gravity water pipelines.
- 24x7 Water Supply.
- Effluent conveyance & disposal systems.
- Gas distribution System.
- Industrial fluid conveying systems, sewerage lines etc.
- Marine On-shore & Off-shore piping.
- Relining and rehabilitation of existing pipelines.
- Plumbing Systems.
- Solar pumping systems.
- Non-conventional power water heating projects.

In a nutshell, the Corporation is the only 'one-stop shop' encompassing manufacturing and marketing of hi-tech agricultural inputs and piping services as well as processing of agri produce. No wonder, it has distinguished itself as a leader in the domestic as well as global markets. The corporate product range improves productivity and adds value to the agri-sector. Conservation of scarce Natural resources, protection and improvement of the environment emerge as a blessed outcome. The reward has been over millions of smiling farmers and scores of customers in more than 116 countries.

TURBO FOG | JAIN Jain Irrigation Systems Ltd. Small Ideas. Big Revolutions.® | S4C SOLUTIONS FOR CROPS

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